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AUTHOR Trauth, Eileen M.
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ABSTRACT

In the policy making process, one of the important steps is the consideration of the consequences deriving from the alternative choices. For the case of information policy, the present research has begun the development of a methodology for doing so. The methodology chosen was modeling. Information policy modeling serves the dual purposes of further clarification of the phenomenon under study along with the provision of an avenue for quantitative analysis through computer simulation. Following an examination of three policy model configurations--maximization, optimization, and adaptive--the adaptive or cybernetic representation was chosen as the most appropriate way to represent the information policy making process. In addition to the intended role of modeling in this research setting, another perhaps more important function emerged. It was the use of modeling as a tool for better understanding of information policy itself. A list of references is attached. (Author/SW)

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AN ADAPTIVE MODEL OF INFORMATION POLICY: A METHODOLOGY FOR STUDYING THE CONTROL OF A POWERFUL RESOURCE

by

Eileen M. Trauth

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Dr. Eileen M. Trauth
Department of Computer Information Systems
Bentley College
Waltham, Mass.

In the policy making process, one of the important steps is the consideration of the consequences deriving from the alternative choices. For the case of information policy, the present research has begun the development of a methodology for doing so. The methodology chosen was modeling. Information policy modeling serves the dual purposes of further clarification of the phenomenon under study along with the provision of an avenue for quantitative analysis through computer simulation.

Following an examination of three policy model configurations -- maximization, optimization, and adaptive -- the adaptive or cybernetic representation was chosen as the most appropriate way to represent the information policy making process. The data collection was directed, in part, towards the support of this view. That is, data was sought which would give evidence of the existence of the hypothesized subsystems of the model. In addition, the identification of general information policy components was also attempted.

The mechanism for doing this was content analysis. Documents reflecting information policies were studied for their contribution to the existence of the model configuration and to the components of the model subsystems. In order to capture the breadth of information policy, sources were used which represented the levels of interorganizational and intraorganizational regulation as well as the information functions of storage and retrieval and dissemination. They were: 1) the activities centered around a National Program for Library and Information Services; 2) the proposals for a rewrite of the Communications Act of 1934; and 3) the University of Pittsburgh's information policies.

In addition to the intended role of modeling in this research setting, another perhaps more important function emerged. It was the use of modeling as a tool for better understanding of information policy itself. That is, the act of modeling requires that many implicit notions be made explicit. In so doing, discussion about information policy and information policy modeling will have been facilitated through the provision of a concrete notion about which to react.

An Adaptive Model of Information Policy: A Methodology for Studying the Control of A Powerful Resource

Dr. Eileen M. Trauth
Department of Computer Information Systems
Bentley College
Waltham, Mass.

Introduction

Reporting on this area of research can be viewed as responding to a series of questions regarding information policy in general, its evolution, its importance, and ways in which it can be studied. As an emerging area of scientific investigation, not much about this phenomenon can be assumed as commonly understood. Therefore, we will begin at the beginning.

What Is Information Policy?

Information policy can be viewed as a mechanism whereby better coordination between legal requirements and practices can occur. That is, information policy can serve to provide a philosophical perspective by means of which conflicts can be arbitrated. More concretely, information policy can be defined as a set of activities enacted to achieve some goal within an information setting.

Specific activites directed toward the establishment of information policies can be observed at both the national and local levels. The totality of statutes, judicial decisions, and governmental practices represents the current approach to information policy at the national level. This current state can be characterized as decentralized. Recently, however, there have been recommendations for a more centrally organized and administered information policy in this country.[1] Such recommendations would have a single office (or advising body) develop and implement information policies.

Within organizations in the private sector information policy activities are also apparent. These actions are motivated by two factors. On the one hand, individual organizations are charged with implementing certain features of information policy mandated at the national level (e.g. privacy, fair credit reporting). They must, therefore, be cognizent of information policy in order to do so. Additionally, good management practice assumes that policies regarding all aspects of the organization are constructed and monitored. This notion is increasingly being applied to information practices.

More and more, information in an organization is being viewed as a resource of sufficient importance to warrant considerable management attention. In the public sector the report of the Commission on Federal Paperwork[2] highlighted the need for effective management of the "information resource". Elsewhere, in the literature it is recommended that information be managed in much the same way as the other important resources - human, fiscal, material and natural.[3] And so, intraorganizational information policies have emerged.

Why Does It Exist?

Whether viewing information policy as a coordinated plan of behavior at the national level or as a set of management directives at the organizational level, the rationale for its development derives from the fact that information and its associated practices are playing an increasingly important role at all levels of society.

One thing that is certainly not new about information is its existence. Information practices[4] are as old as humanity itself. Likewise, the often undesired effects of some of the practices (e.g. censorship and privacy invasion) have long been with us. Thus, there have always been controls or laws regarding information practices.[5]

What is new, however, is that information practices have grown tremendously of late[6] and the consequent complexity calls out for added attention. For example, record keeping is a fact of life at any given organizational level, and so decision procedures or policies regarding record keeping efficiency, effectiveness, etc. are developed. In addition, however, there are also requirements mandated at the governmental level that have an impact upon record keeping practices (e.g. privacy). Thus, along with the increase in information practices has come an increase in legal requirements regarding these activities to the point that contradiction and inconsistency have begun to appear.

An example of this contradiction is seen in the attempts to implement the Privacy and Freedom of Information Acts. An area of conflict lies in the fact that the Freedom of Information Act encourages a narrow interpretation of the guarantee of confidentiality in its disclosure exemption six (only in case of "...a clearly unwarranted invasion of privacy."[7]), while the Privacy Act mandates active procedures on the part of federal agencies for the protection of personal privacy. No locus other than the courts presently exists to provide a basis for the resolution of such conflicts[8]

An example of inconsistency is evident in the regulatory conflict engendered by the decreasing ability to distinguish between computing and communication.[9] Whereas each domain was once separate and distinguishable and regulation derived more or less logically from the properties of the technologies involved, at present the line between the two must often be drawn arbitrarily.

The preceding treatment of information practices and their coordination and control can be considered without ever having to take into account the technology facilitating the given practice. That is, certain issues such as the privacy concerns surrounding record keeping practices transcend the available technologies for doing so. And the discussion of issues can logically be conducted at this level. But it would be naive, however, to develop plans for the coordination of information practices without taking into account the effect of certain technologies in facilitating these practices.

The growth and development of information technology is probably the single most influential factor in the evolution of information practices of late. With these tools has come a shift in virtually all

the ways in which data is collected, processed, stored, used, and communicated. These observations can be summarized by stating that the presence of information technology is bringing about consideration of both: 1) age old practices; and 2) the way in which these practices ought to be carried out in light of the new technologies for doing so. Therefore, it is due, in large part, to the emergence of advanced information technology in recent years that information practices as old as humanity itself - the collection, access, and dissemination of information - are being scrutinized with the intent of formal control in mind.

Why Is There A Need To Formally Study Information Policy?

As previously indicated, information is currently recognized as a resource or phenomenon of increasing importance. As such, it warrants scientific investigation. Further, because information is such a critical feature in today's society, it would also seem to be incumbent upon scientific investigators to probe further into the response of an information-based society to proposed policies which would influence the conditions under which the society will function. Thus, the formal study yields two contributions: a better understanding of this phenomenon, information policy, and a means for consideration of the potential consequences deriving from alternative information policies.

What Is A Viable Methodology For Studying Information Policy?

One might begin to wonder how the policy makers would be able to decide, in advance, the consequences of implementing alternative information policies. Even before that, how will they be able to express in explicit form something that has remained more or less implicit? For without a firm conception of the phenomenon - information policy - under study, how can meaningful exploration into its consequences occur? Out of the plethora of analytical methods for accomplishing both tasks, one that appears most appropriate is that of model building.

The objective of model building here is two-fold. First, the act of developing the model forces conceptual clarification of the phenomenon. That is, the process of identifying model components and constructing the model configuration requires a clear understanding of that which is to be modeled. Further, should the model be expressed quantitatively as in the form of a computer simulation, anaylsis of the sort needed for forecasting and other explorations into the possible consequences of proposed information policies is enabled.

What Are The Reasons For An Adaptive Model?

There are any number of ways in which the model components could be instructed to interact; any number of possible configurations of the model. However, certain ones appear to be more suited to the decision making setting. The three considered were the maximization, the optimization, and the adaptive configurations.

The maximization model[10] is based upon the assumption of the "rational being". The critical feature of this model is the existence of "perfect information" or all the data needed to make the objectively best decision - the existence of which is taken as given. Because of this assumption of

perfect information and objectively "best" decisions, this methodology for modeling information policy was rejected. Decisions are usually made under circumstances of extreme uncertainty, both about the present and the future.

Another way of modeling which allows for imperfect information is the optimization model.[11] Here, it is accepted that all the relevant information might not be available to the decision maker. However, this model does assume the existence of a set of "objective strategies" from which the most desirable one for the given goal is chosen. Because this model assumes that one has a clearly identifiable goal, this methodology was also rejected. In developing information policy, quite often all that is known is that the present status is unacceptable. Often goals established, are not the goals attained.

A cybernetic view seemed to respond best to the needs of information policy. Basic to this adaptive (or feedback) configuration is modification of behavior based on feedback derived from experience. Thus, the model enables "learning" just as the policy makers learn through experience. This type of model acknowledges the existence of decision making under circumstances of uncertain information. Thus, it is suggested that the information policy maker makes decisions based on feedback received from the most recent decisions and the ensuing feedback from the present ones.[12]

An adaptive model, quite simply, says the following: Given some disturbance or "problem", an evaluation is made as to whether the effect of this problem leaves society in an unacceptable state. If so, some control feature must be introduced so as to rectify the situation. More precisely, given the range of acceptable statuses or goals (G) of the social system, an environment within which the system operates (E), and a disturbance (D), the regulatory mechanism (R) - or policy - is formed such that when D is introduced, R and E are coupled so as to keep E within G.[13] Figure 1 is a diagram of this configuration.

How Does One Construct Such A Model?

This general configuration was then adapted for expression in terms of information policy activities. The disturbance is expressed as the input to action. What follows is an expression of the response of the environment to the disturbance or action taken. The next feature, decision process, evaluates the situation based on established criteria to determine if the present status is acceptable. If not, the final feature, the components of regulation acts upon the environment to bring it into an acceptable state. This process is seen as continuing until the status of the environment is determined to be "acceptable". At this point, the components of regulation needed to achieve this state constitute the information policy. In skeleton form the adaptive model of information policy can be represented as four subsystems connected by a feedback loop. Figure 2 depicts this.

The specific components of each subsystem were obtained through content analysis of documents in settings where information policy activities are currently occurring. The intent was to incorporate policy activities at both the national and organizational levels. In addition, policy activ-

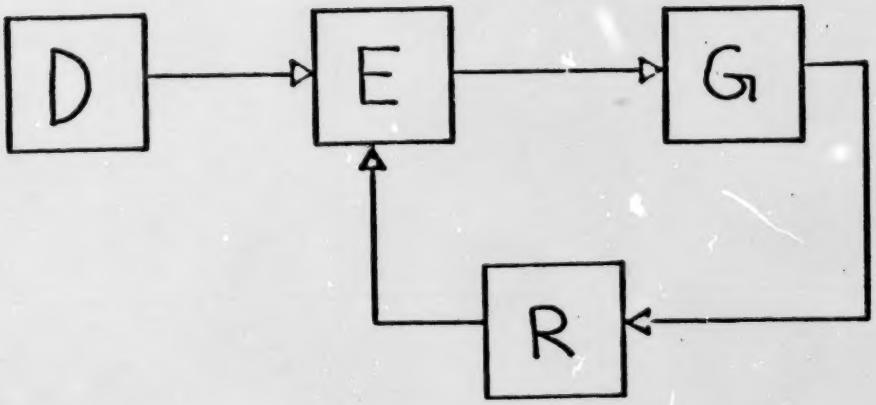


Figure 1

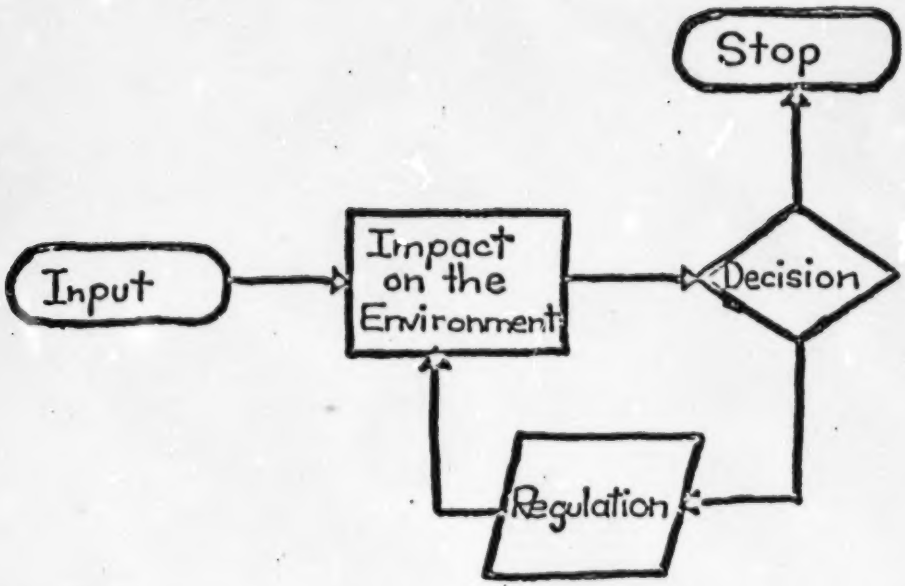


Figure 2

ity regarding a wide range of information functions was sought. In accomplishing these intents the following three settings were used: The activities of the National Commission on Library and Information Science, Congressional activity regarding the amendment of the Communications Act of 1934, and the University of Pittsburgh's internal information policies.

In order to do the classification of the statements in the documents the following decision rules were used:[14]

1. An input to action statement conveys the message: "There is this occurrence (event, phenomenon, problem)."

2. An impact on the environment statement says: "There is this effect on this aspect of society."

3. A decision process statement reflects a desired state of being: "This state should (must, ought to, needs to) exist."

4. A component of regulation statement reflects a needed action: "This action should (must, ought to, needs to) be taken."

Each of the policy settings was analyzed through examination of supporting documentation. At the end of each analysis, then, a list of components reflecting the four subsystems existed. After the analysis of all three policy settings was completed, further compression of the categories occurred.

Each subsystem (across all three policy settings) was then examined in order to compress the number of components in it. For example, the list of statements reflecting input to action were grouped into more general statements reflective of inputs to action that were applicable to all three policy settings. As such, the final decision rule was that:

5. A final component of the subsystem must be evidenced in each of the policy settings examined.

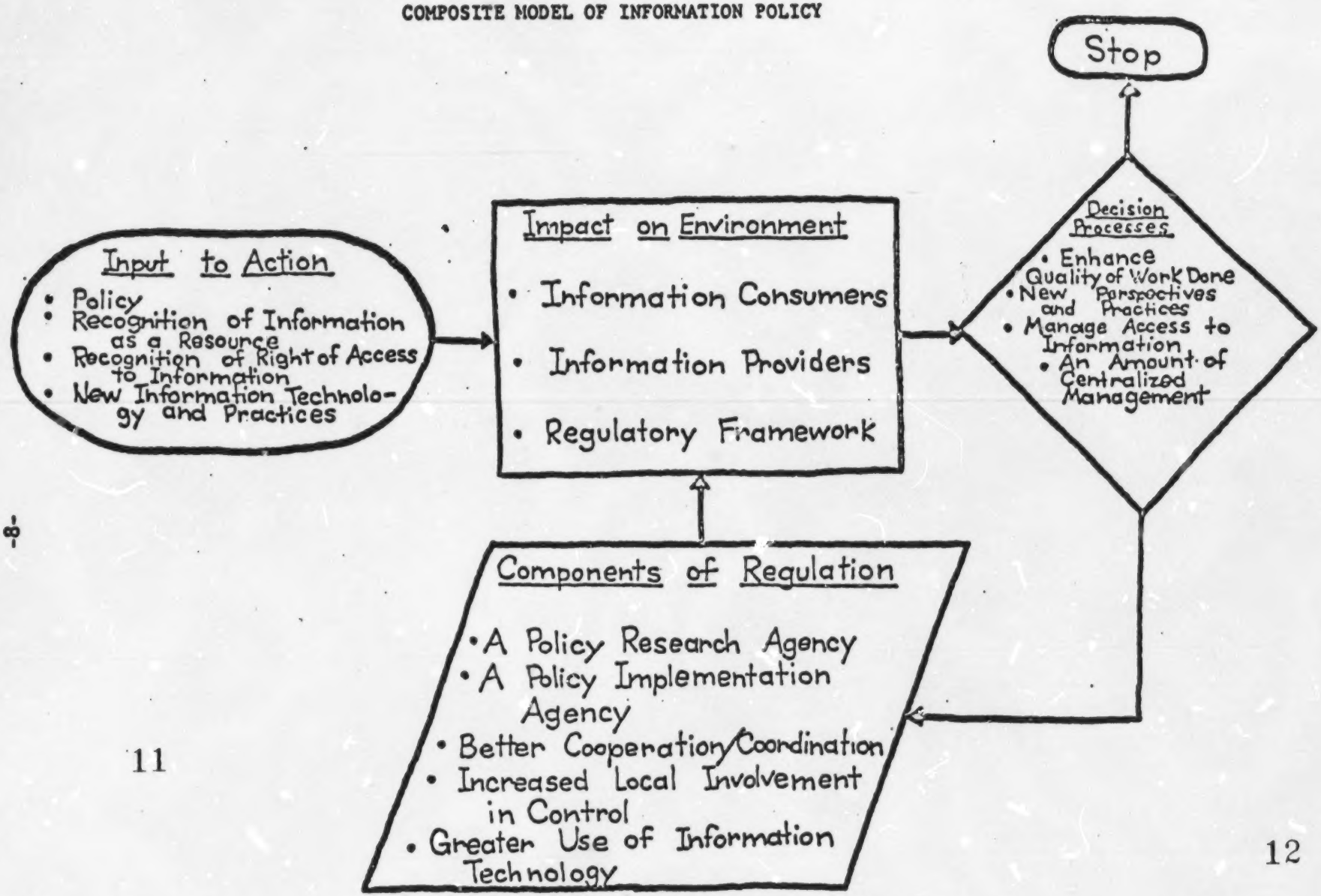
In this way, the resulting model exists as a composite of the instances of information policy studied. Figure 3 represents the resulting composite model - the adaptive model of information policy.

Where Does One Go From Here?

This general area of research can be seen as proceeding in three phases. The first phase has just been described: developing a precise conceptualization of information policy.

The next phase would be to develop a quantitative representation of the model. Specifically, to construct a computer simulation model of it. Also, this model must be tested in order to verify its validity as a representation of information policy.

COMPOSITE MODEL OF INFORMATION POLICY


Stop
Input to Action
• Policy
• Recognition of Information as a Resource
• Recognition of Right of Access to Information
• New Information Technology and Practices
Impact on Environment
• Information Consumers
• Information Providers
• Regulatory Framework
Decision Processes
• Enhance Quality of Work Done
• New Perspectives and Practices
• Manage Access to Information
• An Amount of Centralized Management
Components of Regulation
• A Policy Research Agency
• A Policy Implementation Agency
• Better Cooperation/Coordination
• Increased Local Involvement in Control
• Greater Use of Information Technology

11

12

Figure 3

The final phase would be to use such a simulation model in the analysis of alternative information policies. Since this model endeavors to be generalized, it could serve as a useful tool in the analysis of information policies on both the national and organizational levels. It would also encompass the variety of information activities that are affected by information policy, such as computer applications and communication activities.

An Interesting Outcome

Both the role of modeling in information policy analysis and the primary benefit expected to derive from that effort underwent an alteration in the course of conducting this research. The primary intent of the model building effort at the outset was to develop the first phase of a model that would be of value in assessing the consequences of alternative information policy recommendations. However, as the modeling effort was carried out the role of modeling in conceptual clarification grew in importance. It was noticed the very act of representing information policy in the form of a model is a radical step. This is because it attempts to make explicit those assumptions, expectations, and behaviors that are a part of the information policy process, many of which have historically remained at the unconscious and implicit levels. Thus, a mechanism for comparison between what the policy makers say and what they actually do becomes available.

Thus, as a result of the experience of attempting to create a model of information policy, this second role of models emerged as equally important. This is not to denigrate the importance of modeling and simulation to explore alternative futures. It is just to recognize that the adaptive process was at work in the conduct of this research as well. This recognition serves to further justify the use of an adaptive model in settings of uncertainty such as information policy as well as that in which this research was conducted.

Major Contribution

In this researcher's view, the major contribution of this work was the attempt at a wholistic perspective on information policy. Just as information, information activities, and the technologies that serve them are as diverse as any area of study could be, the information policies established to coordinate and control them are diverse as well. But in studying the sample policy settings, it was found that there are, nevertheless, common elements. It would seem that if coordination and consistency across information activities is to occur, then the need sometimes exists to look at what the different information policies hold in common.

Further, if such analytical tools as computer simulation are to be of use in the information policy formation process, then this wholistic perspective which is required for a generalized model, is crucial.

NOTES

1. For example, Domestic Council Committee on the Right of Privacy. National Information Policy: Report to the President of the United States. Washington, D.C.: National Commission on Libraries and Information Science, 1976.

2. Commission on Federal Paperwork. A Report of the Commission on Federal Paperwork: Final Summary Report. Washington, D. C.: U.S. Government Printing Office, October 3, 1977.

3. For example:
Donald A. Marchand. "Information Management in Public Organizations: Defining a New Resource Management Function." The Bureaucrat. (Winter, 1978). pp. 4-10.

Adrian M. McDonough. Information Economics and Management Systems. New York: McGraw-Hill Book Company, Inc., 1963.

4. Loosely defined as data acquisition, cognitive processing, memory, communication, etc. - whether human, mechanical, or electronic.

5. Censorship of the written word, for example, goes back to Plato. See Anne Lyon Haight. Banned Books. New York: R. R. Bowker, 1970.

6. Commission on Federal Paperwork. Final Summary Report.

7. U. S. Congress. The Freedom of Information Act of 1974. Public Law 93-502. 1974.

8. Robert R. Belair. "Inadequate Privacy Protection in FOIA and the Privacy Act." Bulletin of the American Society for Information Science. 3 (October, 1976). pp. 13-16.

9. David Farber and Paul Baran. "The Convergence of Computing and Telecommunications Systems." Science. 195 (18 March 1977). pp. 1166-1170.

10. John von Neumann and Oskar Morgenstern. Theory of Games and Economic Behavior. Princeton: Princeton University Press, 1944.

11. Herbert A. Simon. "A Behavioral Model of Rational Choice." Models of Man. New York: John Wiley and Sons, Inc. 1957. pp. 241-260.

12. Eileen M. Trauth. An Adaptive Model of Information Policy. Doctoral Dissertation. University of Pittsburgh, 1979.

13. W. Ross Ashby. "Chapter 12: The Error-Controlled Regulator." An Introduction to Cybernetics. London: Methuen and Co., Ltd., 1964. pp. 219-243.

14. Trauth. An Adaptive Model of Information Policy. pp. 38-39.